EXPLORATIONS IN THE LOP DESERT

BY

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With kindest regards of
A. Stein

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The journey to be described in these pages formed part of an extended trip undertaken under the auspices of the Indian government which during three years (1913-1916) carried me through the whole length of Central Asia, from Kashmir to the ancient Great Wall of China and back again to India across Turkestan and the eastern borderlands of Persia.* A brief account of it may serve to illustrate the geographical and archeological aims for the sake of which I returned to the dreary region where the Tarim River, and with it the united drainage of the huge basin of Chinese Turkestan, finally loses itself amidst wastes of dried-up salt marsh, bare clay, and drift sand.

Ever since my first visit to the Lop Desert in the winter of 1907, described in my "Ruins of Desert Cathay," the fascination of the region had drawn me. There were problems of distinct geographical interest, connected with the question of the "desiccation" of innermost Asia, to be studied in that desert depression, some 300 miles from east to west and about half the distance across, between the foot of the Altin-tagh, a range belonging to the Kwenlun system, on the south, and the barren hills of the Kurnuk-tagh, an outpost of the Tian-shan, on the north. Most of the ground still remained unexplored.

Equally attractive to me was the hope that I might find there ruined sites long ago abandoned to the desert and that they might yield to the spade more relics of that ancient civilization which, as the joint product of Indian, Chinese, and Classical influences, had once flourished in the Tarim Basin and upon which it has been my good fortune to throw light by my former explorations. Chinese historical records show that through those dismal and now wholly waterless tracts had once passed an important trade route, by which in the first centuries before and after the commence-

* A preliminary account of the whole journey, with map in 1:7,500,000, appeared in the *Geogr. Journ.*, Vol. 48, 1916, pp. 97-130 and 193-229.

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ment of our era China secured its earliest direct contact with Central Asia, India, and the distant West. To trace this route right through over ground as yet unexplored was a task which by its combined geographical and historical interests forcibly appealed to me.

Work in the Lop Desert would be possible only during the few winter months when the severe cold permits of the carriage of water in the convenient form of ice. So, ever since my start from Kashmir at the end of July, 1913, I had been obliged to travel and work at high pressure in order to arrive in good time. By dint of constant exertions I had managed to accomplish the journey of some 2,200 miles across little-known portions of the ice-clad Hindukush ranges, the Pamirs, and along the whole length of the great Takla-makan Desert, that true "sea of sand," in a little over five months, and at the same time to carry out what new explorations my routes offered a chance for.

Entrance into the Lop Region

On January 8, 1914, I arrived at Charkhlik (map, Fig. 1) together with three of my Indian assistants. A few days later I had the satisfaction of being rejoined by Rai Bahadur Lal Singh, my faithful old travel companion from the Survey of India, who during a separation of nearly four months had been effecting important surveys along the high main range of the Kwenlun. It was at that little oasis, the only settlement of any importance in the Lop region, that I had to procure the whole of the supplies, labor, and extra camels which our several parties would need in the desert eastwards.

I found the difficulties of this task greatly increased by a local upheaval, characteristic of the troubled conditions of Chinese Turkestan, which had just preceded my arrival. It was a queer story, this irruption of a band of Chinese "revolutionaries," *recte* bandits, from Charchan who, without interference from the Turki Mohammedan population, had murdered the local Chinese magistrate and set up their leader as *amban* in his place, only to be within a week surprised and killed in turn by a party of Tungan troops in the pay of the provincial "government." All Chinese civil authority had disappeared, without which no effective help could be hoped for from the easy-going Lopliks and their indolent *begs*. The passage of fresh bodies of Tungan troops threatened completely to exhaust what slender supplies the two hundred homesteads of Charkhlik still retained.

Archeological Work at Miran

After six days' anxious stay at Charkhlik we transferred our base to Miran, two long marches away to the east, the last spot of cultivation on that lonely track through the "Desert of Lop" which Marco Polo followed about 1273 on his one month's caravan journey to Sha-chou, or Tun-huang,

on the westernmost border of China proper. In 1907 I had made important discoveries there among ruins which mark the site of the earliest capital of the Kingdom of Shan-shan or Lou-lan, as the Chinese annals

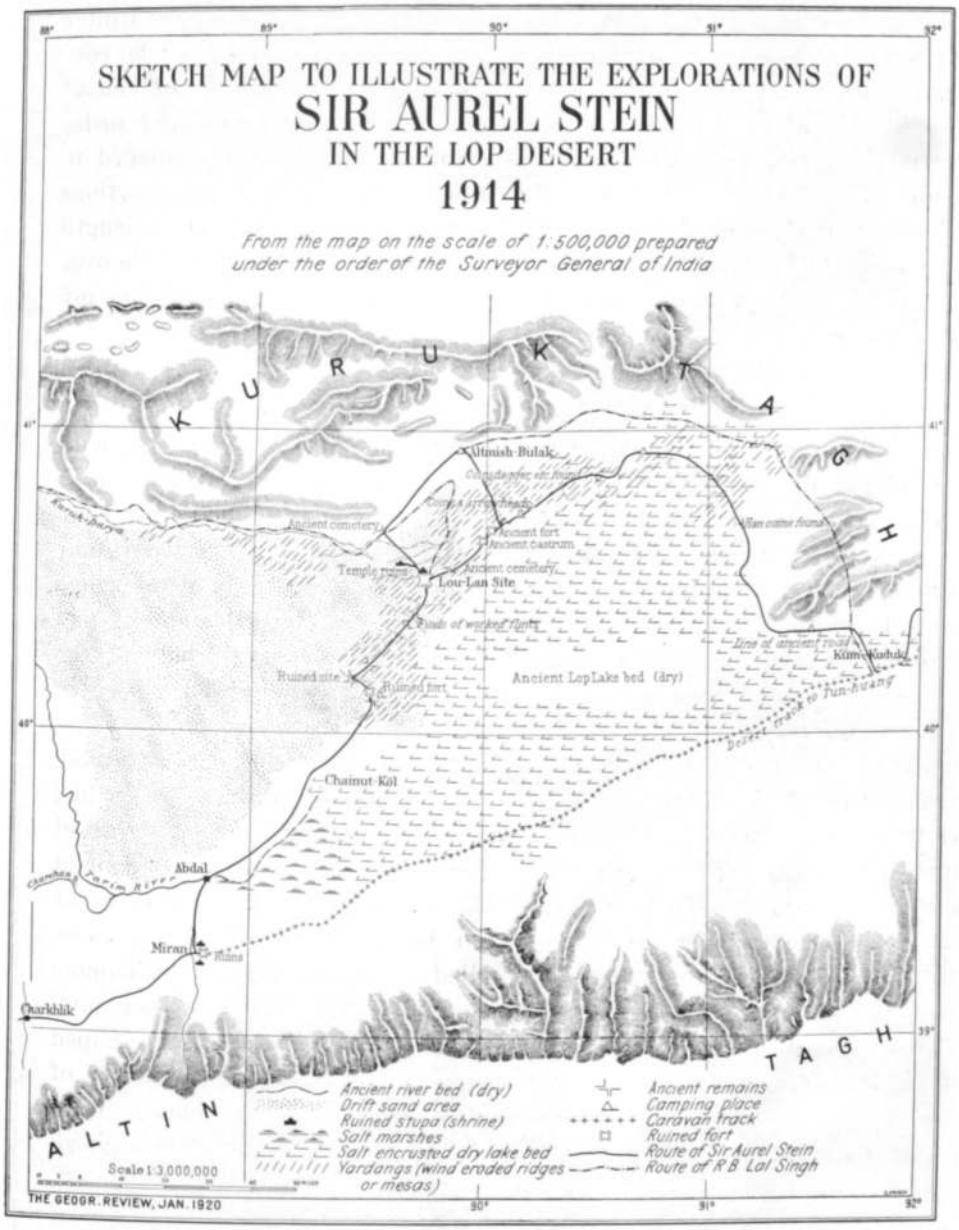

FIG. 1

call it, corresponding to the present Lop region. From two ruined Buddhist shrines, dating from the early centuries of our era, I had brought to light wall paintings of supreme artistic interest, strikingly reflecting the

FIG. 2—Interior of ancient fort with wind-breached portion of rampart, southwest of Lou-lan site. Heavy timber débris in foreground marks position of completely eroded structure. (All photos by the author.)

influence of the Greco-Buddhist art of the northwestern frontier of India, and some almost Hellenistic in character. Owing to shortness of time and technical difficulties we had then been able to remove the frescoes from only one of these temples. The recovery of what survived in the other temple proved a very delicate task. The icy blasts which almost constantly sweep across the bare gravel glacis at the foot of the Altin-tagh made the work particularly trying. But in the end we succeeded in removing and packing with all needful care for their long journey to India the friable plaster panels of the fine frescoed dado with its cycle of youthful figures, set between graceful garland-carrying putti.

Strange, indeed, seemed the contrast between the pleasures of life, symbolized on these crumbling walls by some modest artist from the far-off Hellenized East, and the lifeless desolation of the ruined site as it now is. But it impressed itself even more strongly upon me through the manifold anxieties and cares which attended my fortnight's labors at Miran. I knew that a timely start was essential for the execution of the explorations I had planned in the waterless desert north and northeast of the present Lop-nor marshes. It was certain that without adequate transport and supplies it would be impossible to effect the whole of my program or even to transport my heavy baggage by the desert track towards Tun-huang.

Preparations for the Desert Journey

For the sake of my proposed excavations I needed to take a comparatively large party of laborers into the desert, and my own fifteen stout camels would not have sufficed merely for the carriage of the ice which was to keep us all supplied with the minimum provision of water and still less for that of the indispensable food and equipment. In the disturbed state of affairs at Charkhlik it had been impossible to secure hired camels besides the seven I managed to bring from Charchan. My supplies for men and beasts during a minimum of two and a half months were equally far from completeness.

Amidst all these preoccupations there appeared unexpectedly, as we were at work at the ruined temple, Sher Ali Khan, an enterprising Pathan trader from Bajaur, now on his way to Khotan with silk and tea from distant Szechwan. I greeted his burly figure clad in heavy furs with delighted surprise. Seven years before I had met him at Tun-huang, and, as an old acquaintance and mindful of what he owed to the *sircar* as an Indian subject, he was eager to help.

In his caravan were ten hired camels from Tun-huang which, after a good rest, might become fit for facing the long journey back under loads. In addition, the lucky encounter enabled me to confide to the care of this trustworthy merchant the heavy cases with frescoes and other antiques which my excavations at Miran had yielded, for safe transport to the

British Consulate at Kashgar, some two months' caravan journey westwards.

It was of some advantage, too, that the dozen families of Lopliks, who formerly dwelt at Abdal, near the marshes of Lop-nor, as semi-nomadic fishermen and hunters, had since 1908 transferred their homesteads to the patches of land now again after centuries of abandonment irrigated from the stream of Miran. The fact of their transformation into casual agriculturists made it easier to secure from among them laborers, together with a few camels and some additional supplies.

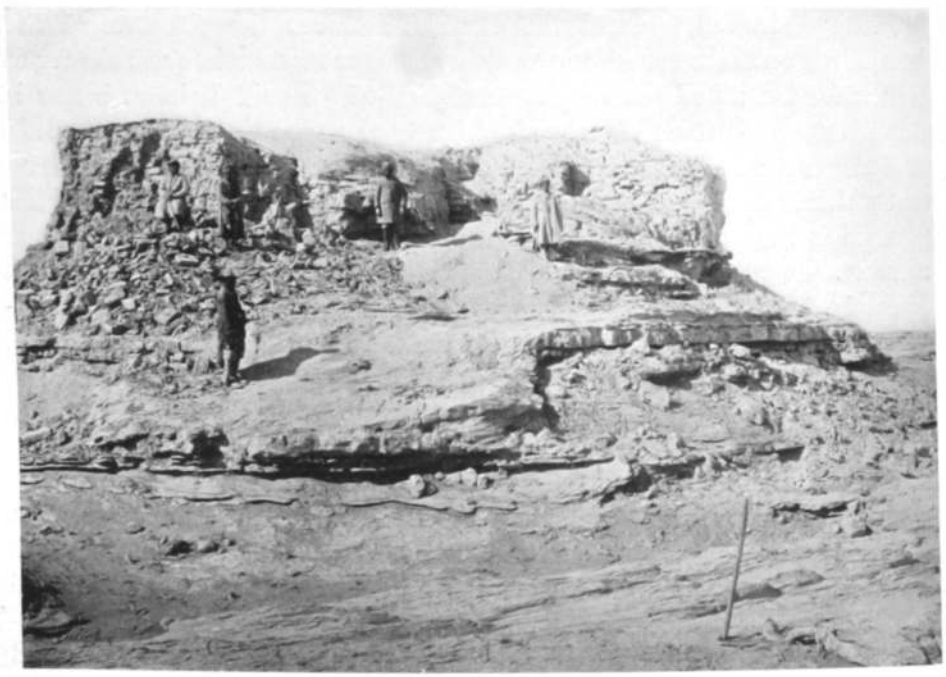

FIG. 3—Remains of ruined *stupa*, or shrine, on wind-eroded terrace, Lou-lan site. (Naik Shams Din in middle of ruined mound.)

On January 23 I started Lal Singh to Tikenlik, a small Lop colony seven marches northward by the terminal course of the Tarim. There, if all went well, he would pick up the seven strong camels I had asked Abdur Rahim, the hardy hunter from Singer and my old guide of 1907 in the Kuruk-tagh, to provide. From Tikenlik Lal Singh was to carry out a survey of the ancient dry river bed and its branches by which the waters of the Konche-darya once reached the area, now wholly desiccated desert, south of the Kuruk-tagh foothills. There Sven Hedin had discovered in 1900 the ruins of the "Lou-lan" site which seven years later yielded me abundant archeological spoil, and there was to be our rendezvous.

Some days after Lal Singh's departure I sent off Muhammad Yakub Khan, my second Indian surveyor, by the desert track leading to Tun-

huang, in order to carry a series of exact leveling operations from the northeastern end of the great salt-encrusted basin which marks the ancient dried-up Lop Lake, to the point where, I believe, the drainage of the Su-lo Ho coming from the far-off Nan-shan ranges had once joined it.

My own tasks included the excavation and clearing of any ruins which might be revealed by the exploration of the dried-up delta of the Kuruk-darya, or "Dry River," and the search for the ancient Chinese route once leading eastward from Lou-lan. Adequate time had to be assured for the latter rather hazardous task and for the survey of the unexplored northern

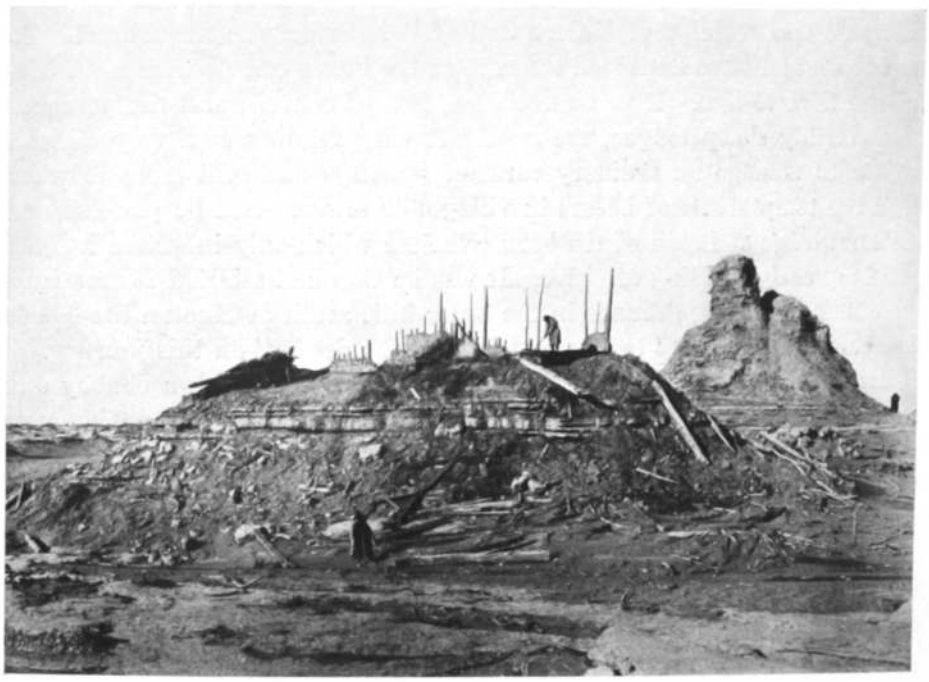

FIG. 4—Ruined dwelling on wind-eroded terrace, with *stupa* ruin on right, Lou-lan site. (Laborer on top of terrace marks original ground level.)

and eastern portions of the great salt-encrusted lake bed which, there was reason to assume, that ancient route must have passed through or skirted. All this would have to be done before the winter cold broke up or the staying power of the camels, on which everything depended, became exhausted.

What with big loads of ice sufficient to assure minimum allowances of water for thirty-five people for at least one month; with food supplies for one month for all and for an additional month for my own people; and with the indispensable outfit of tents, furs, felts, etc., to afford protection in the wintry desert exposed to freezing gales, the thirty camels I had succeeded with great difficulty in procuring, including my own, were by no means too many. It goes without saying that everybody had to walk and that the twenty-five laborers taken had to help by the carriage of light loads.

Native Personnel of the Party

Most of them were hardy Lopliks, inured to privations and exposure in the desert by generations of semi-nomadic existence and yet accustomed, too, by the recent change in their condition of life to wielding the *ketman*, or hoe, that excellent implement of the Turkestan digger. I also had the support of my trusted old Loplik follower, Tokhta Akhun. First employed by Sven Hedin, he had previously proved most useful to me by his pluck and his instinct of the born hunter of wild camels. A curious contrast to him was Hassan Akhun, my quicksilvery head cameleer from Kashgar, with whom readers of my former personal narratives, "Sand-Buried Ruins of Khotan" and "Ruins of Desert Cathay," have become acquainted. To no one could I have entrusted the care of the brave camels with more confidence than to him. Ever quarrelsome, full of conceit, and the possessor of a terribly sharp tongue, the small but wiry fellow was a very difficult person to manage on ordinary caravan journeys and still more so when near the temptations of bazars in villages or towns. But he possessed all the knowledge and skill of the born cameleer which only inherited instinct and long early training can give. It was he who had selected for me from the summer grazing grounds in the outer hills south of Khotan the fifteen fine camels which were to be my "ships of the desert" on this journey.

His staff was completed by his nephew, young Mahmud, a chubby and rather phlegmatic boy, and by Mahmud "the big," a quiet young Khotanese whom I had transferred from Lal Singh's party and who in time learned to accommodate himself to his imperious "skipper's" ways.

January 31 was my last day at Miran and a terribly busy one. Short as we were of camels, fresh trouble had arisen two days before by two of our own having strayed from the scrubby jungle belt near the Miran stream. They had been tracked into the desert towards Charkhlik, and search parties had to be organized to secure them if possible.

Start of the Desert Journey

The next morning I had the satisfaction of seeing my large column started at last for the desert northeastward. It had cost great efforts to organize it at this last humble outpost of Turkestan civilization, and the trouble and pressure involved had, no doubt, been felt by the easy-going Lopliks; but, when the leave-taking was all done and rewards had been duly deposited, I could see in their honest Mongolian faces only the reflection of kindly feelings and good wishes for my success. Rarely had the Turki farewell, "*Yol bolsun*" ("May there be a road"), sounded in my ears so pregnant with meaning.

There was delightful peace and a sense of nature still alive in the belt of thickly growing wild poplars through which our track first led along the dying course of the Miran stream. Then we passed into a zone of

somber tamarisk-covered sand cones, typical of the true desert margin in the south of the Takla-makan, and finally, crossing a dismal expanse of absolutely bare salt-impregnated plain, reached the bank of the Tarim by nightfall. A little cluster of mud hovels and reed huts marked the abandoned fishing hamlet of Abdal. But one of these had been kept habitable by Tokhta Akhun and, fitted for the occasion with warm felt rugs, offered welcome shelter for my first good night's rest after many anxious weeks.

The nights were still bitterly cold—during one of them the minimum thermometer registered —12° F., and a strong sheet of ice covered the deep but narrow channel through which the Tarim in its sluggish terminal course empties itself below Abdal into the marshes and lagoons of Lop-nor; and so the crossing of our many camels with their loads to its north bank could be effected with ease in the morning. It was strange to feel that in crossing those forty yards of ice we had passed over all that was left of the waters, so extensive in spring and summer, which the glacier-clad high ranges of the Kwenlun, the eastern Pamirs, and the Tian-shan send down into the huge Tarim Basin.

A cloudy sky and the dust haze raised by the bitter northeast wind blowing into our faces made the ground traversed in the day's march look even more lugubrious than it was by nature. A succession of dreary reed-covered marshes on our right fringed the course of the dying Tarim, while northward extended a bare sandy plain with thin scrub and scanty tamarisk-crowned sand cones, the slow growth of centuries along the edge of the true desert of drift sand. Far away were dimly seen the soft outlines of its yellow big dunes. We followed a well-marked track of Loplik fishing parties and hunters, and in the late afternoon it brought us to a string of small lagoons fed by the spring floods of the Tarim, the last place where we could find good ice to carry into the desert.

The ice was nearly a foot in thickness and tasted perfectly fresh, though the water was very brackish and scarcely drinkable for men. All through the night the ice cutting and packing continued by the light of bonfires, and by dawn next morning forty-three bags were ready. They had been tied under Hassan Akhun's expert direction to those *shotas,* or pairs of short ladders, which throughout Turkestan serve for the convenient carriage of camels' loads. When at last the convoy was started, with all camels heavily laden and twenty carrying ice, progress was necessarily slow. All day we passed between or across dry lagoons, covered with a thin crust of salt, or *shōr,* which on my march to Lou-lan in December, 1906, had still held water. The total absence of live vegetation near these lake beds was striking, as if the hardy reeds and tamarisks of the desert edge had been too wary to plant themselves near such short-lived inundations of the dying river. It is different with the fish, as Tokhta Akhun explained from long experience. Having been carried into these depres-

FIG. 5—Wind-eroded clay ridges (*yardangs*) with remains of ruined dwelling in fore, Lou-lan site.

sions whenever exceptional spring floods fill them at intervals, they remain behind while the channel that brought the fresh water gradually dries up. As the water left in such lagoons gets more and more brackish, the fish rise nearer to the surface and are then caught with ease by the Lopliks.

Nature of the Country Traversed

Next morning we set out for our immediate goal, a ruined fort in the desert northward which Tokhta Akhun had sighted, apparently in 1910, when he returned from the Lou-lan site after guilding thither Mr. Tachibana, the young Japanese explorer. On the morning of February 4 I started my caravan with confidence. The atmosphere had cleared with the rapidity characteristic of the desert winter, and, as if to assure me of the accuracy of our plane-table survey, there showed clearly about eighty miles away to the south the snow-covered Kwenlun range.

The ground traversed on the day's march was still easy, permitting the camels in spite of their heavy loads to maintain a steady rate of two miles an hour. The succession of wide shallow lake beds which we crossed or passed by showed signs of having dried up recently. Only boggy patches remained, and at one point some small pools. Their water was so salt that no ice had formed over them. Towards the end of the march we came upon the first patches of ground cut up by the erosive action of the wind into small clay ridges with shallow trenches between, all running from east-northeast to west-southwest. They were the familiar *yardangs* of the desert round the Lou-lan ruins (see Fig. 5).

I did not feel sorry when the troublesome belt of *yardangs* gave way again to a wide dry lake bed with patches of reeds and low thorny scrub growing on its northern edge. It was the last chance of some grazing for the camels, and not without good reason had Tokhta Akhun chosen the spot for the night's camp. A group of high sand cones covered with thick tamarisk growth mostly dead served him as a convenient guiding point and now furnished some shelter for the men and abundance of fuel for the camp fires. The first distribution of ice was made that evening by Naik Shams Din, my "handy man" from the Bengal Sappers and Miners, to everyone in our large party. All the men had been made to bring their main food supplies in the shape of ready-baked small loaves of bread; and so the daily issue to them of ice could be limited to a quantity sufficient to provide about three pints of water for the jug of tea required by each one in the evening and again in the morning.

An early start was assured the next morning. Climbing, as soon as the sun rose, a big tamarisk cone some forty feet high, I had the satisfaction of sighting through a powerful binocular the ruin we were bound for far away on the hazy horizon. The ground crossed as we steered towards it was desolate in the extreme. Not a trace of living vegetation survived

on the expanse of bare clay which the erosive action of wind had cut up into an unending succession of steep terraces separated by trenches and troughs. Their direction, invariably running east-northeast to west-northwest as elsewhere throughout the Lop Desert, showed plainly how the prevailing winds have during countless ages swept down from the cold uplands of southern Mongolia into the depressed Lop-nor basin.

Prehistoric and Historic Finds

Forewarned by experience on my former journey I had told the men to keep a close lookout for relics exposed by wind erosion, and scarcely had we covered six miles in our weary tramp across *yardangs* when the first stone implement, a flint arrowhead, was picked up under my eyes. The promised small rewards, promptly paid, made everybody keen for this hunt, and the finds increased so rapidly that I had my hands and pockets soon filled with them.

All kinds of simple implements of the Stone Age were represented among these finds, the small saws, knives, and scrapers of Paleolithic man, as well as stone arrowheads and celts of a more advanced stage. Potsherds, too, of Neolithic type soon appeared in plenty. There could be no doubt that we were passing across a belt which in prehistoric times must have been regularly inhabited. Presently we picked up a well-preserved Chinese copper coin of the type which was common under the Han dynasty immediately before and after the beginning of our era.

As more coin fragments of the same type followed it was clear that occupation had here continued into the earliest historical period as yet traceable in the Lop-nor region. Then we came upon a broad bed running west to east, shown unmistakably as that of a river by its uniform depth, its winding banks, and the rows of dead *toghraks*, or wild poplars, which lined them. Shriveled and bleached by centuries of exposure, some of the gaunt trunks still stood upright.

Exploration of a Ruined Fort

A mile farther on we reached the ruined fort (Fig. 2). Its ramparts, forming a square of about 200 yards, rose boldly above the ground outside, which erosion had cut up and lowered in places fully fifteen feet below the original level. Their solid construction in layers of brushwood fascines and wild poplar trunks alternating with layers of stamped clay, fully 32 feet wide at the base, would alone have sufficed to assure me of the antiquity of the ruin; for it was the same system which I had found before in all fortified posts and stations built by the Chinese on their first advance into the Tarim Basin. Rapidly we unloaded the camels and stacked their precious loads of ice under the north wall of the fort where its foot, partially undercut by wind erosion, offered shade and protection from the

FIG. 6

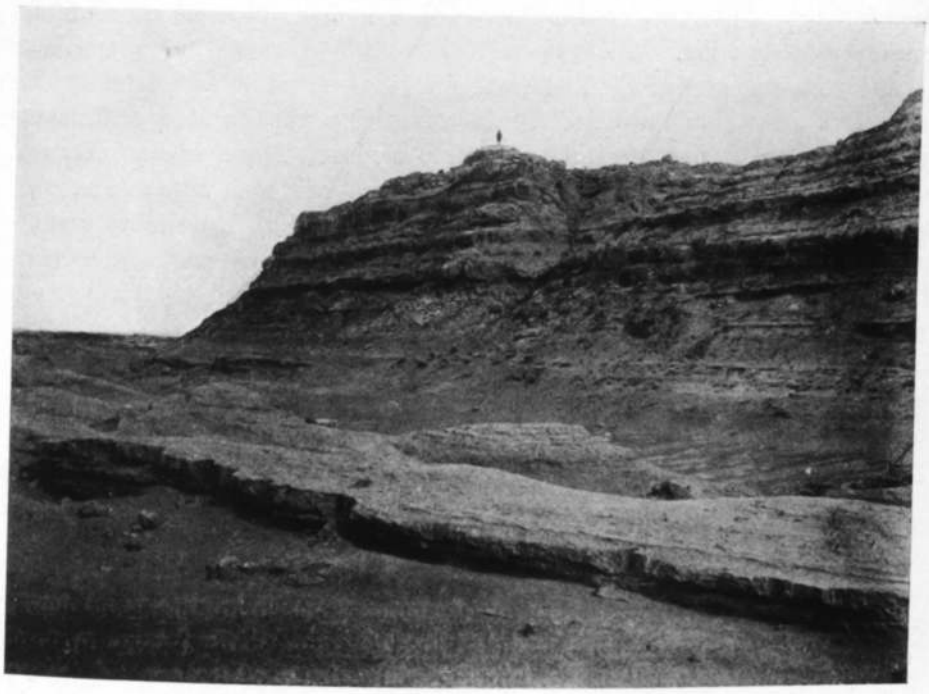

FIG. 7

FIG. 6—Interior of ancient Chinese fort, with ramparts built of reed fascines. (Top of débris-covered mound marks original ground level before wind erosion.)

FIG. 7—Wind-eroded clay ridge, northeast of Lou-lan site, bearing remains of ancient fort.

midday sun. Then Afrazgul, with Niaz Pawan, a young Loplik hunter, and two camels carrying light loads of indispensable food, ice, and kit, was despatched westwards to reconnoiter a second small fort which Tokhta Akhun had reported and to search for more ruins along the ancient river course we had crossed.

I lost no time in exploring the fort. It was marked by foundation beams, some of them thirty feet in length, indicating a structure of a very solid type. Portions of the wall were built of timber and plaster. Wherever breaches occurred in the walls sand had entered and much sand-blasting had been done. The eastern wall was well preserved, for much drift sand had collected in the leeward side of the rampart, filling the rooms here to a height of seven feet and more. This heavy cover of sand had preserved the internal arrangements, such as sitting platforms, fireplaces, carved posts supporting the ceiling, in good condition.

The doors by which the rooms communicated with each other were still in their places, with folds ajar, just as the last occupants had left them. One still retained the coarse string intended for its fastening. One of the rooms, in which we found a small clay-built platform with its top reddened by fire and close by a roughly carved wooden trough probably used as a cooling tank, had evidently been tenanted by a blacksmith. Fragments of large jars in coarse pottery and of a few iron instruments had been left behind; but otherwise there was a curious absence of signs of continuous occupation.

Everything pointed to the little fort's having probably been intended to serve as a station on the direct route connecting the Lou-lan settlement with Miran, the ancient capital of the Lop region. There was an absence of agricultural implements and of indications of local cultivation, the straw in the plaster of the walls was all of reeds, and all the timber was of riverine jungle. Owing to its distance from cultivated ground the site had been occupied only at intervals. Our survey proved that it lay on the straight line leading from Miran to Lou-lan, almost exactly halfway between the latter and the nearest point on the Tarim. The Chinese copper coins and other small metal objects which the men picked up in numbers on eroded soil near the fort left no doubt of its dating back to the early period of Chinese occupation in the first centuries of our era.

Excavation of a Near-by Ruined Site

Soon Afrazgul returned from his reconnaissance bringing good news. Northwest of Tokhta Akhun's second ruined *kurghan* he had come upon a scattered group of small ruins, unmistakably those of houses, where he found coins, beads, and other small objects. Leaving Afrazgul behind to make an accurate plan of the large fort, I moved out next morning with my posse of diggers to the new field of work.

Tokhta Akhun's second *kurghan* proved a small circumvallation of the same type, measuring inside some 70 yards by 46. In spite of the solid construction in which courses of tamarisk fascines alternated with thicker layers of clay, the destructive force of erosion had here, too, completely effaced the northeastern portion of the ramparts. No trace of any structural remains in the interior could be found. But within the southeastern corner a small area of the ground had received protection by a thick deposit of refuse, consisting mainly of reed straw and dung. Evidently at one time the place had been used as a shelter by shepherds.

As the men proceeded to dig away at the litter there emerged abundant rags of felt and coarse fabrics in wool and linen, together with a few pieces of silk, one showing a neat knot-dyed pattern. I had told the diggers to look out carefully for any fragments of paper, with the promise of a good reward for any piece that might show writing. There was no little excitement when there went up the first shout of "*khat!*" (i. e. writing). It was a tiny piece of thin paper, only about two inches square. But, as I unfolded it with fingers half benumbed from the cold northeast wind, I recognized to my great delight a few characters recalling the old Aramaic-like script of which the few Early Sogdian documents first discovered by me in 1907 at the Lou-lan site and on the ancient Chinese border line of Tun-huang had so far remained the only known specimens.

Three miles farther on, across troublesome *yardangs* and low dunes, there was an ancient river bed clearly marked by dead *toghrak* trunks and, on either bank, appeared widely scattered the skeleton-like remains of half-a-dozen ruined structures. In each case they occupied the top of steep terraces of clay, resembling small islands which wind erosion had carved out from what was once the level area of houses.

It was clear that the erosive action of wind-driven sand had worked terrible havoc here, and when I approached the first ruin it did not surprise me to find that the wattle-and-timber wall still surviving of the large central hall rose only two feet or so above the ground. But fortunately a thick refuse layer had helped to protect the original floors here and in portions of the rooms once adjoining.

As soon as we began to clear it there emerged pieces of fine colored rugs and other fabrics in abundance from beneath reed straw, camel dung, and the like. Soon there followed Chinese paper documents, one quite large, and a fragment of a text beautifully written in that modification of ancient Indian script known as Central Asian Brahmi. When at last there appeared a small wedge-shaped record on wood in an early Indian language and the same Kharoshthi writing which I knew so well from hundreds of wooden documents of the third century A. D. unearthed at the Niya site in the south-central Takla-makan, there remained no possible doubt about the early date of these ruins and the civilization to which they belonged.

Interesting finds, too, of small objects of personal or household use came

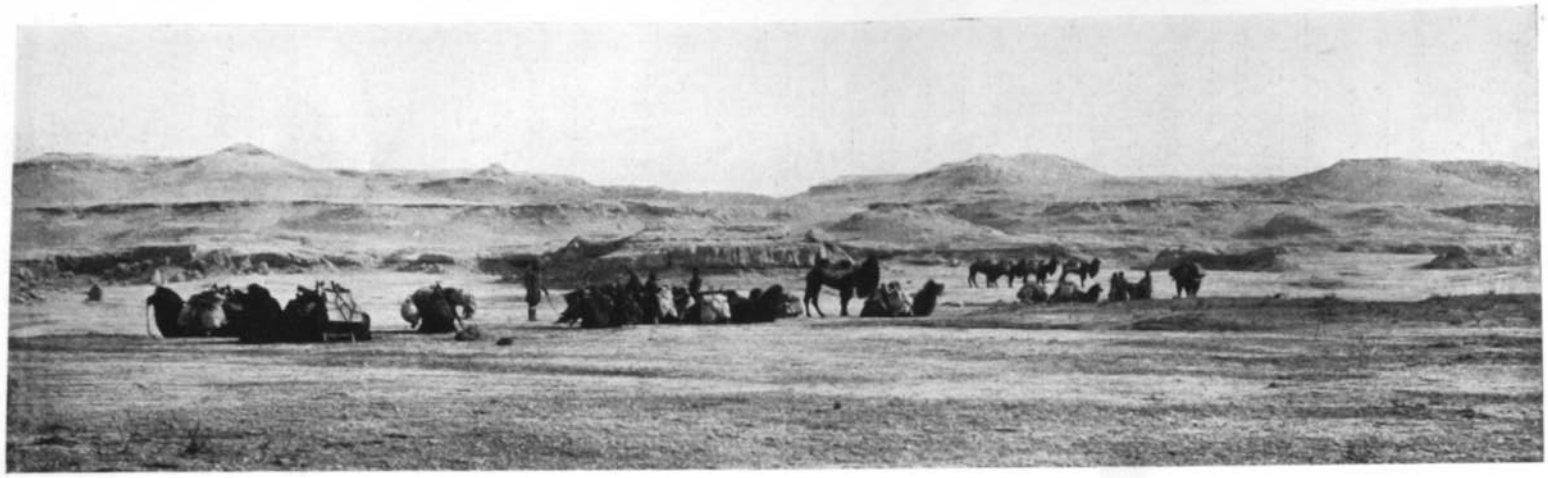

FIG. 8

FIG. 9

to light in plenty, closely agreeing in type with those recovered before from the Lou-lan site. There were strips of brocade and pieces of a bag in many-colored silk; fragments of a richly ornamented headpiece with bridle in leather and bronze; a finely carved wooden cup and bowl; two large eating trays of wood, etc. From a sheltered corner there turned up in quick succession four large boards beautifully lacquered in Pompeian red and decorated with bronze studs which must have formed originally part of a box, besides many other objects of smaller size, such as an arrow shaft, spindle, bone spoon, etc. In the central hall the massive wooden pillar, about 15 feet long, which had carried the roof, lay athwart the floor; and, owing to the protection provided by a raised sitting platform on one side, the boldly carved double bracket in wood with fine volutes which had once surmounted it was recovered in perfect condition. Encouraged by well-earned rewards the men worked their *ketmans* with zeal.

Those houses where rubbish heaps had helped to ward off erosion from the original floors yielded more relics of interest, including paper documents in Chinese and ancient Indian scripts. The discovery of a well-preserved record containing ten lines of neatly written Early Sogdian text rejoiced me greatly; for, apart from its philological value, it confirmed my identification of the tiny fragment already unearthed. At other ruins, where the force of erosion had swept the ground bare except for the heavy timber and any hard débris, we had to be content with remains of architectural carvings, of miscellaneous objects in metal and stone, of fragments of pottery, glassware, and the like. To give some idea of the destructive power of the slow but unceasing erosive agency at work, it may be stated that at one of the badly attacked ruins I found the adjoining ground scooped out to a depth of fully 22 feet below the original level.

The antiquarian evidence obtained sufficed to establish the essential fact that the settlement, probably agricultural in part, had been occupied down to the beginning of the fourth century of our era, and by people sharing the same civilization, due to the mixture of Indian, Chinese, and Western influences, which my finds of 1906-1907 at Lou-lan and Miran had illustrated. A variety of physical features observed in the immediate vicinity of the ruined settlement threw fresh light, too, on the hydrography and early occupation of this now waterless part of the Lop-nor region during historical times and those immediately preceding them. For the latter the abundant finds of stone implements such as Neolithic arrowheads and jade celts, which we picked up from the eroded surface of the ground near these ruins, afforded safe guidance.

Sojourn at the Lou-lan Site

I now turned towards the main Lou-lan site which I intended to make my base for our next explorations. Leaving behind the heavier antiques

to be picked up later, I started my column in the early morning of February 9 for the new goal.

Our crossing was favored by an atmosphere of unusual clearness for this wind-swept desert; and, when after a tramp of close on twenty miles we pitched camp in a belt of ancient riverine jungle, the glorious evening light seemed to diffuse warm life and beauty over this strange landscape in spite of the deathlike torpor in which it has lain for centuries. Far away to the north showed up the reddish crest line of the barren Kuruk-tagh hills. Its sight raised the spirits of the men quite as much as the roaring camp fires which the abundance of ancient firewood allowed them to keep up.

We had not marched more than five miles the next morning when the appearance on the bare eroded soil of fragments of bronze ornaments and glassware, soon followed by Chinese copper coins of the Han type, proved that we had entered that belt of the ancient delta to which occupation in the early centuries of our era extended. That the bare clay of the ground became more and more a close maze of steep ridges and furrows was another indication of our nearing the Lou-lan ruins. At last, climbing with Tokhta Akhun to the top of an isolated dead tamarisk cone, I sighted far away, and only a few degrees out of the bearing we had tried to steer, the ruined *stupa* tower which I remembered as the landmark of the main site of Lou-lan.

During the next three days we were kept busy at this ancient station. The varied finds of antiques and documents which our explorations yielded made it certain that the ruined site, though small in size, had served as an important administrative post on that ancient route by which Chinese commercial and political expansion first penetrated into Central Asia at the close of the second century before Christ. The difficulties of this desert route, owing to the want of water over a great portion of it, must always have been very serious; and early in the fourth century A. D., as the critical examination of the Chinese manuscript finds from the site made by M. Chavannes, my distinguished Sinologue collaborator, clearly shows, it was deserted altogether. From the archeological evidence collected by me, it is safe to conclude that about the same time the settlement of which the Lou-lan site was the chief place was finally abandoned to the desert. It seems probable that the event was directly connected with the drying up of the ancient river bed of the Kuruk-darya, which previously had carried the waters of the Konche-darya, now absorbed by the Tarim, to the settlement and upon which its existence must have wholly depended.

To search for the line of the ancient Chinese route eastward beyond the Lou-lan station and for any remains which might be found along it was the main task which had brought me back to this forbidding desert. It was only towards the end of my previous visit in 1906 that the extensive rubbish heaps, covering the ground around what had been the administra-

tive headquarters, or *yamên*, of the old Chinese station, revealed themselves in their true meaning as mines of records of all sorts thrown out as "waste paper." A further number of ancient documents on wood and paper were now recovered. Chinese records formed the great majority; but our careful search brought to light also Kharoshthi tablets, some showing the oblong official shape evidently connected with the indigenous administration, and a complete letter in the same early Indian script written on a piece of silk which had subsequently been sewn up to form a bag, besides several paper records in the Early Sogdian language.

The same fierce east-northeast wind prevailing during the greatest part of the year which has sculptured the soil of the Lou-lan tract into *yardangs*, since it lost its water and with it the protecting cover of vegetation some sixteen hundred years ago, had sufficed to grind down and carry off almost completely the eastern and western faces of the circumvallation of the ancient Lou-lan station which stood across its course and against which it acted with full force. The northern and southern walls owed their partial survival to the fact that they stretched in the direction of the prevailing wind and thus offered far less scope for its erosive action. The whole circumvallation formed a square of approximately a quarter mile on each side, and observation with the prismatic compass proved that the ancient Chinese engineers had been careful to adapt its orientation exactly to the prevailing direction of the wind, thus assuring the maximum of shelter for the occupants as long as the walls would hold out against that incessant assault.

Excavating Near Lou-lan

On the bitterly cold morning of February 14 with the temperature at —12° F. I took the laborers out to the nearest of the ruins toward the west, which had been discovered by Lal Singh in his reconnaissance survey of the dead channels of the dry river. After some interesting geographical observations on the temporary return of moisture after a prolonged period of drought and after further collections of ancient stationery in wood, curious household implements, and a decorated bronze mirror, I set out for the more distant ruins to the northeast. In time we came to some small bronze fragments and potsherds, indicating that the ground had once been occupied. At length we came to an ancient burial site with large grave pits marked by rough tamarisk posts.

We found here an abundance of household implements of all sorts, objects of personal use such as artistically decorated bronze mirrors, wooden models of weapons, Chinese records on paper and wood, and, above all, a wonderful variety of fabrics of all hues which delighted my eyes. Among them were beautifully colored silks, pieces of rich brocade and embroidery, fragments of fine pile carpets, by the side of coarse fabrics in wool and felt. It soon became clear that these remnants of garments of

all sorts had been used for wrapping up bodies, perhaps partially embalmed; and the experience gained by me a year later in the exploration of cemeteries of the Tang period at Turfan has fully confirmed this conclusion. I could not have hoped for a more representative exhibition of that ancient silk trade which we know to have been a chief factor in opening up this earliest route for China's direct intercourse with Central Asia and the distant West.

I soon realized from various indications that the contents of these pits must have been collected, before the final abandonment of the Chinese

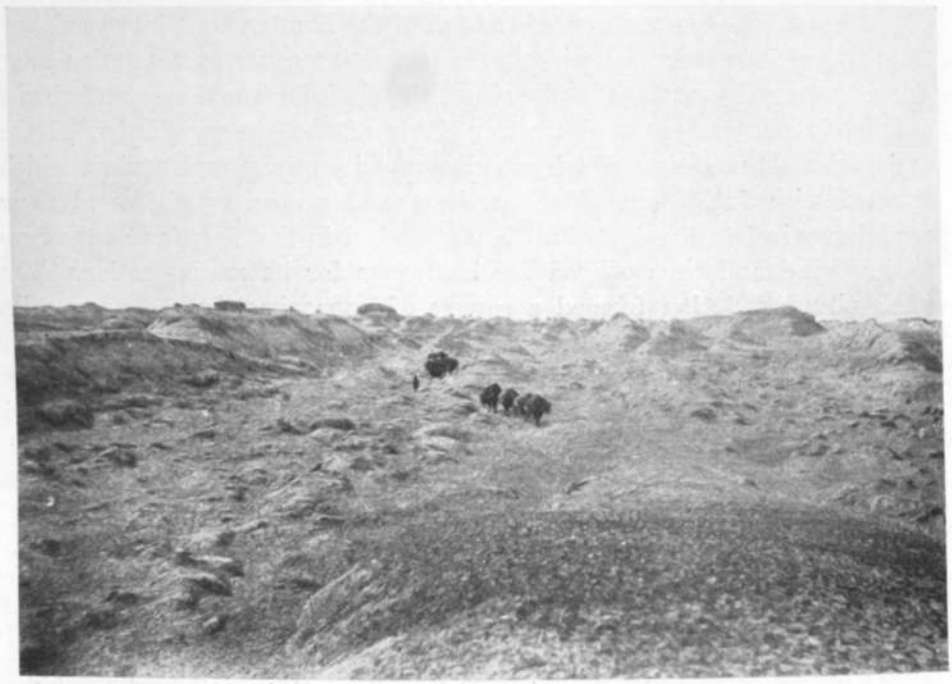

FIG. 10—Camels marching between salt-encrusted ridges near northeastern shore of ancient dried-up Lop-nor.

station of Lou-lan, from older graves which wind erosion or some similar risk was threatening. Consequently all the relics here saved from destruction, in obedience to a pious custom still prevalent among the Chinese, could safely be assigned to that period of the Han dynasty which followed the first expansion of Chinese trade and political influence into Central Asia about the close of the second century before Christ. In any case none of the remains could be later than the third century of our era.

EXPLORATION OF AN ANCIENT FORTIFIED STATION

We next sought the large walled enclosure of which Afrazgul had told me and whose dark-outlined ramparts had helped to guide us from afar. It was a long weary tramp. But all fatigue was forgotten over the delight of the interesting discovery made upon arriving. The walls of the ancient

station, forming a square of about 450 feet and remarkably well preserved in spite of twenty centuries of exposure, were built with regular layers of stamped clay and carefully secured reed fascines. Their constructive features showed closest agreement with those I remembered so well from the fascinating remains of that westernmost extension of the ancient Chinese border wall, or *limes*, which I first traced and explored in 1907 in the desert of Tun-huang. A rapid inspection soon convinced me that we had struck the fortified *castrum* which had served as a *point d'appui* for Chinese missions and troops where they first reached Lou-lan territory, after

FIG. 11—Camels with baggage and ice loads crossing salt-encrusted bed of ancient Lop-nor. (Hassan Akhun on extreme right.)

having crossed the salt-encrusted dry bed of the ancient Lop Lake and skirted its absolutely barren northern shores. A variety of antiquarian observations makes it certain that this fortified station dated, like the Tun-huang *limes* itself, from the first military advance of the Chinese into the Tarim Basin, about 104 B. C., and that it represented the bridgehead, as it were, of the desert route by which that advance was made possible.

The walls, from 12 to 18 feet thick at their base and in most places still standing over 10 feet in height, had nowhere been seriously breached, while the open ground outside had been scooped out and lowered to as much as 20 feet below the original level, as marked by the foot of the ramparts. In the interior, some of the beams scattered in utter confusion were fully a foot across and still over 25 feet in length.

Ascending the rampart at daybreak next morning a striking view opened out before me as the sun rose. To the north and northeast in the distance showed strings of reddish-brown *meshas*, bold clay terraces of great height rising in island-like isolation along what looked like the shore of a salt-encrusted dry sea. The ground separating us from the nearest among them seemed to have been worn down by the wind with fair uniformity, and what *yardangs* there were looked low. To the west and southwest a dismal maze of erosion ridges and trenches met the eye. But eastwards the view ranged unbroken over a vast grayish-white plain of salt, unending in its flatness like the ocean in a calm. It was the flat bed of the ancient dried-up Lop Lake and of the fresh-water lagoons and marshes which must once have fringed it on this side during early historical times.

An Ancient Lookout Post

The *mesha* nearest to the northeast was the one which by its bold castle-like outlines had attracted Afrazgul's attention on his reconnaissance march from the south and on which he had traced remains of human occupation. A three miles' tramp across low *yardangs* and salt-encrusted patches brought us to it. With steeply eroded slopes the long and narrow clay ridge rose before us to a height of over a hundred feet (Fig. 7). The strata of clay composing it showed almost vertical faces along the longer sides and at its sharp northeastern point, thus rendering access possible only from the southwestern end, where the *mesha* tapered away in easy steps.

The northeastern end of the ridge, which was its highest portion and about 30 yards wide on the top, had been separated from the rest and turned into a small fort by a massive wall of clay blocks built across on the southwest. A deep trench cut into the hard clay, about 6 feet wide, ran in front of the wall and helped to protect the only accessible side of the stronghold. The gateway leading into it still showed its timber framework, and in one of the rooms which had been built against the protecting wall the big roughly cut beams of wild poplar wood which once supported the roof remained *in situ*. A small heap of oat straw we found here was of importance as proving that cultivation of some sort must have extended even to this vicinity. Refuse of reed straw and horse and cow dung thickly covered the floor in two other rooms, and from here we recovered a variety of interesting small finds. Besides remains of rough household implements in wood, such as a fire block, as well as a thin ring in gold, these included some records on wood and paper, both in Chinese and in that early Indian language written in Kharoshthi which my previous discoveries prove to have been in official use even in this distant part of the Tarim Basin during the first centuries of our era.

A Mummy 1600 Years Old

Everything indicated that the fortified top of the *mesha* had served as a stronghold and lookout post for some petty chief of the indigenous population of Lou-lan. Of the physical type and simple semi-nomadic ways of the Lou-lan people, as the Chinese found them on the first opening of the route through the desert, the Han annals have preserved some curious notes. The accuracy of these was illustrated in a most striking fashion by the examination of the graves which we found covering the central portion of the ridge. The very first grave we opened furnished vivid glimpses of a phase of human existence which seemed to have vanished as completely as had living nature itself for long centuries from this land of the dead. But they were striking enough to stir the stolid Loplik diggers into a state of undisguised trepidation. Under five pieces of excellently preserved cowhide lay the coffin as sound as when first made. It was formed by two solid halves of a *toghrak* trunk, hollowed out to serve as sides, with two smaller pieces for headboard and footboard. Above and resting on the side trunks were placed seven closely fitting top boards. When these were carefully removed one after the other by Sadik, a young Loplik whom the hope of "treasure" and the promise of a special reward had induced to pluck up courage for this and similar tasks, we saw before us the body of a young man, absolutely intact as it had been buried certainly not less than sixteen hundred years ago.

The face and the headdress were exposed, as well as the feet cased in short boots of red leather. A large cloak made of a coarse but well-woven brown woolen fabric enveloped the rest of the body. On the head was a conical felt cap decorated with narrow circular bands of red braid and an aigrette of feathers. Attached to the top of the cap were tassels made up of some small animals' tails. Small jug-shaped baskets excellently woven with patterns in different-colored straw held remains of foodstuffs which still await close examination, like the rest of the relics brought away from this and other sites. Tied up near one edge of the cloak was a small packet of crushed leaves, no doubt intended, like the contents of the baskets, to provide the dead with creature comforts in another existence. Pins of hard wood fastened the garment in front, and when this was loosened and thrown back we found the body quite bare but for a loin cloth made up of a close-set row of thick tassels in brown wool. Feathered arrow shafts lay by the side of the body. The features were distinctly non-Mongolian, recalling that *Homo alpinus* type, widespread in Europe, which still supplies the prevalent element in the racial constitution of the indigenous population of Chinese Turkestan and which in Asia is seen in its purest form among the Iranian-speaking hillmen near the Pamirs.

It was a strange sensation to look upon this and other figures which still retained the semblance of life and to feel oneself brought face to face with people who inhabited, and no doubt liked, this dreary Lop-nor region in the

first centuries of our era. Everything about them indicated a race of semi-nomadic hunters and herdsmen, as the Chinese annals describe the people of Lou-lan. In spite of the trade route which Chinese enterprise opened through the areas of riverine jungle and marshland serving them for their chase, their fishing, and their pasture, they had evidently clung to their time-honored ways and retained their distinct if primitive civilization.

The general appearance of those old Lou-lan men whom our *ketmans* had for a brief span of time brought again to the light of the sun seemed curiously to accord with the significant juxtaposition in which small bronze objects of Chinese origin were picked up on the slope below the little fort together with stone implements of various sorts, including a jade celt. Elsewhere, too, I came upon indications suggesting that the interval separating the latest Neolithic period in Lou-lan from the first advent of the Chinese may not have been a long one.

Our survey proved that the Lou-lan site, the fortified station, and the stronghold on the *mesha*, all lay along a straight line leading due northeast. It seemed a clear indication that the ancient Chinese trade route I was anxious to trace onwards followed the same direction.

Start for the Northern Edge of the Lop Desert

On the morning of February 17 we started on our return to the Lou-lan base camp, still pursued by the violent *buran*, or sandstorm, which had overtaken us in the fortified station, to which we had returned the previous afternoon upon the completion of our work on the *mesha*. Fortunately the storm abated by midday, and we were able to reach the Lou-lan base by nightfall. Here I found Lal Singh safely arrived after accomplishing all his survey tasks in the west and along the "Dry River" beds on a circuit of some 400 miles.

After paying off my Loplik laborers and sending them back to the world of the living, we started out the next morning to carry out the remainder of the journey we had proposed for ourselves in the Lop region. With our united and yet much reduced caravan Lal Singh and myself first moved to the Kuruk-tagh, in order to secure for our hard-tried camels a few days' real rest with water and grazing at the salt springs of Altmish-bulak. The route we followed for a day and a half to the northwest took us across an endless succession of *yardangs*, broken only here and there by dry branches of the ancient river bed. On this utterly desolate ground we again met traces of occupation in early historical times. Where we struck the foot of the bare gravel glacis stretching down from the disintegrated red hill chain of the outermost Kuruk-tagh, I was able to examine two small burial grounds which Lal Singh had first discovered. They unmistakably belonged to the period when the riverine belt below, now dried up and eroded, had been followed by the ancient Chinese trade route.

Thence we turned to the east and, guided by Abdur Rahim, who knew

the ground here from his expeditions after wild camels, skirted the foot of the Kuruk-tagh. Tramping across absolutely bare slopes of detritus and low rocky ridges showing an extreme state of disintegration, it needed imagination to feel that one was near "mountains." And yet after many days spent over drift sand, wind-eroded clay, and *shōr* the hard going seemed a welcome change to the feet. But even more welcome was it when at last by the evening of February 20 we arrived at the tiny oasis of Altmish-bulak. There was little to please the eye in the small area of dusty tamarisk scrub and salty reed beds, scarcely more than half a mile across anywhere, nestling on the western side of a vast barren basin worn

FIG. 12—Wind-eroded clay terraces (*meshas*), 80-100 feet high, near foot of gravel glacis of Kuruk-tagh.

out by dry flood beds. Yet, after the dead world we had toiled in, this little patch of vegetation seemed truly delightful to us humans, and I rejoiced at what it meant for our brave camels. The least brackish of its half-a-dozen small springs gave them their first real drink for three weeks, and from the reed beds around they could gather fresh strength for the hard task which still lay before them.

DEPARTURE ON JOURNEY TO TRACE ANCIENT CHINESE TRADE ROUTE

After four days of rest we left the little oasis on the morning of February 25 in two columns for our respective tasks. The one allotted to Lal Singh was to survey the unknown northeastern shores of the great salt-encrusted basin which represents the fullest extension of the dried-up ancient Lop-nor, and the barren hill ranges of the Kuruk-tagh overlooking them. The well of Kum-kuduk was fixed as the place where he was to rejoin or await me. I myself, accompanied by Afrazgul and Shams Din,

proposed to search for the ancient Chinese trade route where it left the edge of the once inhabited Lou-lan area and to trace it over whatever ground it might have crossed, right through to where it was likely to have diverged from the line followed by the modern caravan track which leads from Tun-huang along the southern shore of the great dried-up Lop Lake towards Miram.

The task was after my own heart, combining geographical and historical interest, and of singular fascination. But I could not disguise from myself the serious difficulties and risks which were bound to attend it. From what I knew of the general character of the ground before us it was certain that we could not hope for water, nor over most of it for fuel to melt our ice with, before striking the Tun-huang caravan track, a matter of some ten days' hard marching, judging from the distance indicated by our previous surveys. There was a limit to the endurance of our brave camels; for with the heavy loads of ice, fuel, provisions, and Chinese silver which had to be carried for safety's sake, I could not expect the animals, already hard tried by the preceding work in absolute desert, to remain fit for more than ten or twelve days.

Physical difficulties soon presented themselves after we had descended for some 10 miles from Altmish-bulak southeastward to the edge of the bare gravel glacis. Beyond it we struck line after line of wall-like clay terraces, up to 60 feet in height and more, all eroded by the same east-northeast wind which had sculptured the usual *yardangs* of the Lou-lan area, but obviously of far greater age. It was difficult to thread a way practicable for the camels through or across them without prolonged search or détours. Even more trying for the camels was the ground to be crossed between these long rows of *meshas*. Here we encountered a succession of ridges, far less elevated and of soft outlines, but coated with a hard crust of salt-impregnated clay which caused pain and soon lesions, too, to the feet of the camels. It was a surface formation that was new to me but by no means welcome as a foretaste of what we might find farther on. It seemed quite a relief when these horrible salt-encrusted hummocks gave way at last to mere *yardangs* of the usual type. In the red light of the evening the rows of high *meshas* we continued to encounter assumed a fantastic appearance, like bastioned walls of some huge circumvallation. We had not covered more than 17 miles when the manifest fatigue of the camels obliged us to halt by nightfall. For the first time the dead wood to be picked up around for fuel was extremely scanty and had to be supplemented from the store we carried, limited as that was.

Next morning I got the men to rise at 4 o'clock, which assured a start with the laden camels soon after daybreak. As we crossed what proved the last of the strings of *meshas* and ascended the highest for a lookout, the sharp eyes of Afrazgul sighted far away to the south the big isolated ridge which bore the remains of the indigenous stronghold and cemetery we had

explored on February 17. My intention had been to strike the *mesha* to the northeast of it, where Afrazgul on his reconnaissance of the same day had found surface traces of human occupation, and to make this the starting point for the search of the line which the ancient route had once followed onwards. Soon this point, too, was picked up, and, though the ground with its hard salt-impregnated clay lumps continued to try the camels' feet badly, it was reached by noon. Here, to my disgust at the time, camp had to be pitched for the day. One of our camels had broken down a mile or two before and refused to move on though its load had been distributed among others.

The examination of the remains on the *mesha* below which we had halted did not detain me long. They proved to be those of an outlying indigenous camping place. Reed bundles mixed with cow dung, pieces of simple matting, burnt pieces of wood in a small hollow once used for a fireplace, rags of a sheepskin coat, and the like were all that wind erosion had allowed to survive on the top and slopes of the *mesha*. A Neolithic arrowhead and a few similar relics were subsequently picked up below. More significant than these modest remains was the fact that the ridge which had served for this camping place lay, as the plane-table showed, exactly in the line that led from the Lou-lan site through the ruined *point d'appui* and the indigenous petty chief's stronghold northeastward. The fact agreed well with my previous conjecture that the initial bearing of the ancient route we were endeavoring to trace lay to the northeast. But there was obvious need for more definite confirmation; and so I was eager to use the time left by our halt for a careful reconnaissance of the ground ahead.

Identification of Route by Ancient Watchtower

Sending Afrazgul to examine a group of *meshas* which showed north-northeast, I myself set out with Tokhta Akhun for an isolated high clay ridge sighted to N. 60° E. As I approached it, after a three miles' tramp over ground where the last traces of ancient vegetation gradually died away, I noticed on the highest portion of the ridge something dark which looked like the remnant of a wall foundation. But I scarcely ventured to believe my eyes until I had eagerly clambered up the steep *mesha* from the southwest, the only accessible side, and beheld before me layers of carefully fastened tamarisk fascines stretching for over 20 feet along the narrow top of the ridge. Far-advanced erosion had pared the long sides of the ridge so much that the substructure of fascines was reduced to only 7 or 8 feet in width. Yet enough remained to convince me that the methods of construction and the original dimensions were exactly the same as in many of the ruined watchtowers I had examined along the ancient Chinese *limes* in the desert of Tun-huang.

Familiar as I had become with those ruins of Han times I could not

feel any doubt about the character and origin of the structure, however badly eroded, which had once crowned the ridge. It must have been a watchtower built by the Chinese, like the previously discovered terminal *castrum*, probably over two thousand years ago when the route to Lou-lan was first opened and the *limes* itself carried forward towards the Lop Desert. Perched on the high *mesha* that marked the extreme eastern edge of the once habitable area, this lonely tower must have served as a landmark for the traffic that passed by during centuries. A small heap of refuse which had survived in a sheltered hollow just below the foundation contained burnt chips of tamarisk and *toghrak* wood and was definite indication of the tower's having been occupied by watchmen.

Difficulties of Traveling for Camels

This discovery gave the desired confirmation as to the direction of our onward move, and my elation was great. Afrazgul was able to share it when he came to join me, having on his own side found nothing but a single badly eroded grave on a *mesha*, with a skeleton. On my return to camp I found that Hassan Akhun, my camel factotum, had safely brought in the ailing camel after "re-soling" two of its feet, the pads of which had become lacerated by the first day's terrible going over the fissured hard crust of salt.

Other camels' feet also had suffered and become sore. So Hassan Akhun and the other camel-men were busy till nightfall over re-soling them. It was a painful process for the poor beasts, however beneficial in its results, this sewing on of small pieces of thick oxhide to the live skin so as to protect the sore places. Then came in the evening the almost equally troublesome business of giving the camels their draft of rapeseed oil, which Hassan considered it requisite to administer now every second night in order to keep up their stamina. He called it "the camel's tea," and I knew well from previous desert journeys what excellent effect this provision of oil had on camels when subjected to prolonged deprivation of grazing and water. But it was not easy to make the poor beasts swallow it. Only by holding up their heads firmly in spite of violent struggles and by pouring the half pint or so of rancid oil in repeated small doses down their noses could success be assured; and, as the operation was a long one with the more self-willed beasts, Hassan Akhun and his myrmidons were kept hard at work most of the night.

Definition of Route by Finds of Coins and Arrowheads

Next morning we started at the break of dawn into the desert northeastwards. Buoyed up as I was by the discovery of the watchtower, I could not disguise from myself the perplexities which were likely to meet us ahead. I knew that we had now reached the extreme eastern limit of the

area to which the waters of the Kuruk-darya had once carried life. Beyond this there would be no chance of ruins to guide us. The desert eastwards was even in ancient times as devoid of plant and animal life of any sort as it is now. As we left behind the withered and bleached fragments of the last dead tamarisk trunk lying on the salt soil, I felt that we had passed from the land of the dead into ground that never knew life—except on the route to be tracked. The contrast was so impressive that we felt almost regret at taking leave of the former. I little foresaw at the time

FIG. 13—Sir Aurel Stein's party at Miran. (Sir Aurel Stein in middle. On left R. B. Lal Singh and Ibrahim Beg, on right surveyor Afrazgul Khan, seated; Jasvant Singh, Rajput follower, and Muza Akhun, Yarkand caravan man, behind.)

that, as we steered onwards by the compass across absolutely barren wastes of clayey *shōr*, hard crumpled salt or detritus, chance would help us in a way which at times might well seem uncanny.

The first thrilling incident occurred that very morning. We had passed the ridge bearing the remnants of the ancient watchtower, and the last traces of dead desert vegetation were far behind us, when suddenly we found the ancient track plainly marked for about 30 yards by over two hundred Chinese copper coins strewing the ground of salt-encrusted clay among quite low *yardangs*. They lay along a well-defined line running northeast to southwest and about three or four feet across, just as if some kindly spirit among those old Chinese wayfarers who had faced this awful route with its hardships and perils wished to assure us that the bearing we were steering by was the right one. In reality the coins must have

got loose from the string which tied them, and gradually dropped out unobserved through a small opening in their bag or case. They were all of the type common under the Early Han dynasty and seemed fresh from the mint, with rims and legends clear and sharp. Only 8 pieces out of 211 picked up were broken.

Some fifty yards farther on in the same direction we came upon a similar scattered heap of bronze arrowheads, all manifestly unused and looking as if newly issued from an arsenal of Han times. The way in which several were found sticking closely together proved that they, too, had been packed tightly in a bag or case. Their shape and weight exactly agreed with the ancient Han ammunition that I had often picked up along the *limes* of Tun-huang, which was garrisoned during the first century before and after Christ and which is frequently mentioned in the Chinese military records I had recovered from its ruined watchtowers. The way in which the coins and arrowheads remained on the ground suggests that they had dropped from some convoy of stores which was moving at nighttime, probably a little off the main track but still in the right direction. They may well have got lost sight of on the sand then covering the salt-encrusted ground—some sand still remained now between the *yardangs*—until progressive deflation caused them to sink to the *shōr* crust below from which I picked them up so many centuries later.

Other Evidences of the Route

Next day's long march started auspiciously with the reassuring find of a Han coin, picked up within half a mile of our camp, and about six miles farther on brought a discovery that was both stirring and useful. We had followed our northeasterly course across easy ground of bare clay and mica detritus when it approached at a slant a forbidding belt of salt-coated erosion terraces. These clearly represented the type to which the Chinese of Han times applied the graphic designation of "white dragon mounds" as mentioned in an early account of the ancient desert route to Lou-lan. It was an exciting moment when my eyes fell upon a well-preserved dagger of steel, ten inches long and fitted with a crossbar, lying apart on the slope. In this forbidding desolation it was a dramatic surprise to receive such striking confirmation of our still being on the ancient route. As I examined these relics which travelers separated from us by so many centuries had left behind, all sense of time seemed effaced.

But there was more than a mere romantic interest in the find. It was clear that the terrace had served as a regular halting place, because at its foot was the first piece of ground, level and fairly clear of salt, which travelers would strike after passing through the forbidding maze of "white dragon mounds" and the dried-up lake bed beyond. I had to decide whether I was to strike across the latter or to skirt the ancient lake shore by steering a more northerly course, which threatened to take us farther

away from where we hoped to find water. As I suspected and as Lal Singh's survey subsequently proved, it would have meant a détour of days, and the interpretation I put on our lucky find encouraged me to avoid this by heading east for the dead salt lake.

Soon the ground grew difficult, being covered with crumpled-up cakes of hard salt; and when we actually reached the belt of the salt-encrusted "white dragon mounds" progress with the camels was possible only by keeping to the line of these dismal hillocks. Fortunately the salt crust of the depressions between them grew softer after a few miles, and finally a tongue of flat ground with a clay surface but slightly salt-encrusted allowed us to resume the bearing due east and to complete a long and tiring day's march in comparative comfort. At last a line of salt-coated terraces was sighted in front, and this time we greeted the "white dragon mounds" gratefully as marking our approach to "land;" but it took long hours to reach them.

The Margin of the Ancient Lake Bed

When we reached the first patch of soft brownish salt overlying coarse sandy soil just in front of the salt-covered ridges, indicating as it were the opposite seashore, and we could halt for a night's rest, I had good reason to feel glad for my choice of route and grateful for the lucky find which had prompted it. The following marches, as well as Lal Singh's experience on his route farther north, proved that we had crossed the forbidding sea of hard crumpled salt on the very line where it was narrowest, thus escaping a couple of nights' halt on ground where neither beast nor man could have found a spot to lie down in comfort. It was, no doubt, this advantage which had determined the old Chinese pioneers with their keen eye for all topographical features in the choice of this line for their route.

All the same our night's rest was far from cheerful. A bitter northeast wind cut through the warmest furs and wraps. The camels showed signs of feeling sadly the pinch of hunger.

Fortunately the worst of the desert crossing now lay behind us. The ends of a series of low barren hill ranges were sighted to the east. Far away to the southeast I thought I could recognize through my glasses a bold hill crest which I remembered from our survey of 1907 as overlooking the easternmost portion of the ancient Lop lake bed where the track from Miran towards Tun-huang skirts it. Steering in this direction we wound our way for miles through strings of salt-coated terraces, all running northeast to southwest with depressions of hard salt crust between. Trying as the going was it seemed easy after the previous day's experience, and gradually the parallel ridges grew farther apart, with the bare clay between now exposed and undergoing erosion. At last after about ten miles they disappeared altogether, and an open plain of decomposed clay and mica lay before us, stretching down glacis-like from the hill foot eastwards.

Absolutely barren as the ground was it seemed quite a treat for our eyes. The camels, too, felt the comforting change and stepped out as they had not done for days. We had marched on gaily for a few miles when finds of copper coins of the Han type and of glass beads cropped up in rapid succession. It was most encouraging to receive fresh assurance that the line we were following was that of the ancient route.

Our march of March 3 took us steadily south-southeast in the direction of the previously noticed bold group of peaks with which the western end of the southernmost hill chain of the Kuruk-tagh juts out into the basin of the ancient Lop Lake. The salt-encrusted flat surface of the latter was seen on our right stretching away unbroken to the horizon. In order to avoid any of its inlets, which might have caused fresh trouble to our poor camels, we kept well up on the stony glacis formed by decomposed low ridges along the foot of the hills. It was by no means smooth going, but what a comfort it seemed to tread again real stones! The ancient route must have skirted the dried-up salt sea more closely; for we came upon no relics of ancient traffic that day. In the evening we descended to fairly level ground by the old shore line. The ground crossed all day was still absolutely barren, without a trace of even dead vegetation. Yet close to where we camped, after a twenty-one mile tramp, we noticed a wild camel's track among the low ridges of detritus.

The Eastward Arm of Lop Nor

After a night most of which was spent in administering oil to the camels I had to rouse the men by 3:30 next morning. The animals were beginning to show plainly how much they suffered from hunger, and even with loads greatly diminished it became obvious that a timely arrival at grazing and water had to be effected by long marches. Continuing due south for some miles we came into full view of the dead salt lake where it extends a wide arm eastward along the foot of the hill range the end of which we had steered for. We now turned southeast and were after a couple of miles suddenly brought up by precipitous clay cliffs rising some 120 feet above the edge of the ancient lake shore, here stretching from west to east. It was a striking view which here opened out before us. The ancient petrified sea, with its brownish salt crust upheaved into countless small billows, stretched away on the south and southwest unbroken to the horizon, without any thing to distract attention from its impressive uniformity and grim grandeur. There were no strings of "white dragon mounds" hugging the shore line nor any *meshas* looming in the distance.

I knew that this big arm of the ancient Lop Lake grew narrower eastwards; and as the position of Kum-kuduk, computed from our previous surveys, was still far away to the southeast, it was better to keep east along the shore line we had struck and thus reduce the distance to be covered across the trying bed of hard salt. A narrow strip of gravel-covered fore-

shore at the foot of the cliffs, to which we managed to bring down the camels, fortunately offered an easy line of progress. As we skirted this shore line under steep cliffs, projecting in places into eroded bold bluffs and looking exactly like those of a sea still in being, I had the satisfaction of finding clear evidence of the ancient traffic that once moved along here in the shape of small ornaments in stone and bronze which were picked up in succession.

Discovery of a Still Preserved Stretch of the Ancient Road

We had marched some fifteen miles from camp when almost simultaneously Tokhta Akhun's attention and my own were attracted by a narrow but unmistakable old track impressed in the gravel by the side of a wild camel's recent footprints. It was very puzzling at first and almost uncanny, since Tokhta Akhun's experience knew of wild camels following the same regular track only where it leads to water or grazing, and of these there was certainly none now behind us. Had wild camels trodden down this path at a period when some vegetation still grew along the shore line farther west? Or could they possibly have taken to following here a track, first made by man but long since abandoned by him, for the sake of easier approach across the dead salt sea to grazing along the Kuruk-darya before it completely dried up?

But soon my eyes were to meet a sight far more decisive in its evidence. We had followed the wild camel's track for about a mile and then lost it where the shore line curved inwards to the north, leaving a wide bay covered with a hard crust of salt. Wishing if possible to save the camels a big détour, I moved straight ahead to a hillock rising from the western side of the bay about twenty feet, in the hope of finding the surface easier beyond. In this I was disappointed. But, when I had ascended the salt-coated hillock and looked around, my eye was caught at once by an absolutely straight line running right across from the western end of the bay to the headland which I had sighted before as its eastern end. It was the long-sought-for ancient road, preserved here in all the clearness which the salt-encrusted ground could assure. It was a stirring sensation as I looked down on its broad straight line and then, after determining its direction by plane-table, marched along it for nearly two miles. Close examination showed that the road had a uniform width of 20 or 21 feet and was worn down to a depth of about one foot in the surface of hard salt cakes, as a result of the passage during centuries of transport animals and probably carts too. Its surface, owing to a soft crust covering most of the underlying hard cakes of salt, offered far easier going than the ground adjoining on either side. There was ocular evidence here of the magnitude of the traffic which had once moved through these forbidding solitudes. But how those patient old Chinese organizers of transport had maintained it over some 150 miles without water, grazing, or fuel still remained somewhat of a problem.

Beyond the bay the narrow old track reappeared on the foreshore, which now widened and became sandy in places. For about half a mile it ran close along a raised bank some 20 feet wide at its top, a fact which at the time puzzled me greatly. Subsequent observations elsewhere have led me to conjecture that it may mark the alignment of an ancient canal by which the engineers of Han times seem to have endeavored to carry water from the terminal basin of the Su-lo River as far as possible westwards.

End of the Desert Journey

We started late next morning to let the camels enjoy what scanty grazing there was. But as we moved on by the line of shore cliffs eastward the patches of reeds grew wider, tamarisks dead and living appeared on their familiar sand cones, and finally we came upon hardy scrub and thorns thriving in what to our desert-trained eyes almost seemed luxuriance. We halted after a short march, all of us feeling the need of a rest and glad to let the camels enjoy a good feed at leisure. The concession made to men and animals brought antiquarian reward, too, for me; for Tokhta Akhun, when searching in the evening the high bare cliffs of clay above camp, discovered in a small cavelike shelter a quantity of ancient potsherds and an iron buckle dating back, by the evidence of its ornamentation, to the period of the Lou-lan ruins. So to the last relics of the ancient traffic kept by us.

On the morning of March 6 we were off by daybreak, as I hoped by one long march to cross the arm of the dead lake and strike the well of Kum-kuduk on the caravan track towards Tun-huang, fixed upon as our rendezvous. From the top of a high clay terrace some two miles beyond our camp I sighted far away to the south-southeast a line of tower-like *meshas* which, raised by refraction above the true horizon, quivered phantom-like in the white haze. Their bearing coincided exactly with the position which my survey of 1907 showed for the group of big *meshas* I remembered to have passed on my approach to Kum-kuduk by the route from Miran. So towards them we steered straight across the wide expanse. The ground was trying enough, and in places patches of actual salt marsh were now met with which threatened to embog our camels and necessitated great détours (Fig. 10). But even the camels seemed to feel encouragement from the nearness of the goal, and at last after fifteen miles' struggle we struck sandy ground near the northernmost of the *meshas*. A little beyond I could lead the men to their great joy on to the lonely track where footprints of camels, ponies, and donkeys assured them that they had truly reached the "big road" from Miran to Tun-huang. Their Odyssey in the unknown wastes was ended.